the pit which could not have been produced by the stag-horn picks usually employed by the workmen in prehistoric times. He guessed that they were the result of blows by a stone axe, the edge of which had become blunted and battered in a peculiar way by use. When the axe was subsequently found imbedded in the chalk, it was immediately recognised to be the identical tool with which these peculiar markings had been made. There can be no question, therefore, of the genuineness of the implement, or that the mutilation of the edge is contemporaneous with the period in which the tool was made and used. It thus supplies conclusive evidence that the pit was excavated during the period when polished stone implements were in use.

THE annual report of the Transvaal Meteorological Department for the year ended June 30, 1907, shows that there is a considerable increase in the number of observers, all of which are volunteers or attached to other departments. The results of observations are arranged in appendices, as in previous reports; in many cases only means are printed, but the individual observations are available for any inquiry in case of need. In addition to the ordinary weather forecasts for the ensuing twenty-four hours, which are exhibited at every postal telegraph office, weekly forecasts have been prepared for the Agricultural Department when required; these are necessarily more indefinite than the daily forecasts. Investigations on various meteorological subjects are in such progress as the limited staff will permit; several papers have been communicated during the year to the *Meteorologische Zeitschrift* and other scientific periodicals. It may be mentioned that a new thermometer screen, constructed by Mr. D. E. Hutchins, with double laths instead of louvres, as in the Stevenson screen, has been under examination during a year. It costs less than the louvred screen, while the results obtained are practically the same.

THE first number of a new scientific monthly, entitled *Ion, a Journal of Electronics, Atomistics, Ionology, Radioactivity, and Raumchemistry*, has just appeared. It is quarto in form, and contains eighty pages, well printed, with a fair number of diagrams, some of which have, however, been prepared from very rough drawings. About fifty pages are devoted to three articles on "The Charge carried by the α Particles," by Mr. F. Soddy; "Uranium and Geology," by Prof. Joly; and "Transmission of Energy in the World of Electrons," by Dr. H. W. Julius. Fifteen pages are devoted to reports on the various fields of work covered by the periodical, and three pages to reviews of ten books. Prof. Joly's paper is evidently an address, but no indication is given as to where it was delivered, and the reports would be increased in value if references to further sources of information were added. Several of the contributions require more careful editing, as they contain expressions which convey little meaning to a reader not well versed in German, but this may be due to the journal being printed in Germany. It would be a great convenience to its readers if it could be issued with the edges of the leaves cut. Notwithstanding these minor defects, which can be easily remedied in future numbers, *Ion* provides a physicochemical journal long needed in this country.

UNTIL 1893, the conservation of mass in chemical reactions was tacitly assumed in all chemical work. In that year H. Landolt published a memoir in which the validity of this assumption was submitted to an experimental control under modern conditions; in no case were any changes in the total mass of the reacting substances observed outside the limits of experimental error. In a second paper, however, published in 1906, experiments carried out with an improved apparatus appeared to show a slight decrease in forty-two out of fifty-four observations. In a series of control experiments, carried out with vessels in which no chemical reactions were taking place, this decrease was not observed, and Landolt suggested the emission of electrons during chemical reactions as a possible cause of this loss. In last month's number of the *Zeitschrift für physikalische Chemie* the same author contributes a third paper on this subject. In this the slight losses noticed in the earlier paper are traced down to minute volume changes in the glass vessels employed, the after effects of the slight temperature changes accompanying the chemical phenomena. The final conclusion drawn from the results of all the experiments is that no change of mass can be detected as a result of chemical reactions, and the law of the conservation of mass in this case is true within the very small limits of experimental error. Apart from the interest attaching to the rigid proof of this law, universally assumed in all chemical work, the present memoir goes very fully into the effects of changes of temperature on the volume and moisture films of glass vessels, a question arising in all chemical and physical researches involving the accurate weighing of substances in glass.

A CATALOGUE of electrical novelties received from Messrs. F. Darton and Co., Clerkenwell Optical Works, London, E.C., contains descriptions of many simple and cheap motors, dynamos, coils, and other apparatus. The list should be of service in suggesting suitable Christmas presents for youths and others interested in electricity.

A LIST of microscopes and accessories just issued by Messrs. Ross, Ltd., the well-known manufacturing opticians, should be seen by everyone contemplating the purchase of a microscope for pleasure or work in various departments of science. The instruments described are of a high level of construction and efficiency, and each part has been designed with care. The catalogue also contains particulars of new photomicrographic apparatus.

OUR ASTRONOMICAL COLUMN.

MOREHOUSE'S COMET, 1908*c*.—Writing to the *Astronomische Nachrichten* (No. 4284, p. 194, November 21), Prof. E. C. Pickering transmits a message from Prof. Frost directing attention to the increased brightness of Morehouse's comet towards the end of October. It was easily seen, at the Yerkes Observatory, with the unaided eye, whilst with a small field-glass three or four degrees of tail became visible. With the Zeiss ultra-violet objective-prism camera three exposures on spectrum plates were made by Mr. Parkhurst and Prof. Frost, two of them each of one hour's duration. At the time of writing the measurement of the spectra was not complete, but Prof. Frost suggests that they are of the ordinary hydrocarbon type. As no continuous spectrum is perceptible, it is concluded that the radiations at the time of exposure (October 28) were, to a very large extent, intrinsic.

Prof. Pickering reports that photographs taken at the Harvard Observatory on October 30 show a tail at least nine degrees in length, much longer than on previous nights.

Further evidence of the changes which took place in the appearance of the comet, especially at the end of September and beginning of October, comes from Herr Winkler, of Jena, who observed with a 6-inch refractor. In his notes, published in No. 4280 of the *Astronomische Nachrichten* (November 6), he states that no tail was seen on October 1, although on September 28 a tail 40′ in length was observed.

Numerous measures of the comet's position are given in No. 4283 of the *Astronomische Nachrichten*, whilst in No. 4285 of the same journal M. Geelmuyden gives the positions (1900) and corrections for fifty-two comparison stars, extracted from a series of meridian observations of stars between 65° and 70° N. declination, made at the Christiania Observatory during the period 1897–1907.

From Herr Ebell's ephemeris, and Dr. Smart's continuation of it, we give the following abstract:—

Ephemeris (Greenwich midnight).

1908	R.A.	S. decl.	1908	R.A.	S. decl.
	h. m.	° ′		h. m.	° ′
Dec. 3	18 50·3	8 11	Dec. 15	18 50 0	15 6
7	18 50·2	10 38	28	18 49·9	21 34
11	18 50·0	12 56			

THE CHANGE IN THE PHYSICAL CONDITION OF NOVA PERSEI.—According to the spectroscopic evidence published by Dr. Hartmann, Nova Persei changed to the nebular condition in the autumn of 1902, whilst later, in 1906, its spectrum was similar to that of the Wolf-Rayet stars.

Prof. Barnard now publishes a series of measures of the star's focus, made with the 40-inch refractor of the Yerkes Observatory between August, 1901, and September, 1903, and a number of notes regarding the Nova's appearance up to September 20 of the present year, which may throw more light on the details of the various changes.

At first the focus was that of an ordinary star, but between 1902 August 29 and October 6 it increased nearly a quarter of an inch, and became the same as that for a nebula; then from November it began to return to the stellar focus, and by the summer of 1903 the focus was essentially stellar. As no further changes were observed the focus measures were then discontinued.

Prof. Barnard also made focal measures of seven Wolf-Rayet Stars, and found that the focus generally appears to be shorter than for an ordinary star, whilst the stars are yellowish, and in some cases appear to be surrounded by a glow or halo (*Astronomische Nachrichten*, No. 4285, p. 201).

REFRACTION DUE TO JUPITER'S ATMOSPHERE.—In a recent note in the *Astronomische Nachrichten* (No. 4272), M. Chevalier published an account of an observed occultation of a star by Jupiter, and directed special attention to the fact, without offering any explanation of the phenomenon, that the star did not disappear at the point of the planet's limb to which its apparent motion, in regard to the planet, was directed some minutes before; that is to say, the star's apparent path was deflected immediately before immersion took place. In No. 4285 of the same journal (November 24, p. 206) M. E. Esclangon offers an explanation of the phenomenon. It is that the apparent deflection is caused by the horizontal refraction at the surface of Jupiter, and he finds that the observed direction and amount of the deflection are in good accordance with the theoretical value for the refraction. Although the disappearance of the star was apparently instantaneous, a diminution of light, such as might be caused by the absorption due to the planet's atmosphere, was observed.

OBSERVATIONS OF THE ZODIACAL LIGHT.—At the suggestion of Prof. Campbell, Mr. E. A. Fath made a number of observations, at the Lick Observatory, during the past summer, in order to determine, if possible, the true nature of a faint light which has for years been observed along the northern horizon from Mount Hamilton during the summer.

The observations show that it is probably due neither to twilight nor the aurora borealis—although the strong aurora line at λ 5571 was observed spectroscopically both within and without the illuminated area—but to the zodiacal light. Details of the observations are given at length, and they show that the northern boundary of the light reached an altitude of 46° (Lick Observatory Bulletin, No. 142).

L'ANNUAIRE DU BUREAU DES LONGITUDES.—This annuaire, for 1909, is now published, and contains the usual very complete series of tables for use in astronomical, meteorological, geographical, and general scientific work.

The article "Spectres des Étoiles," which used to be written by the late M. Cornu, is replaced by a most interesting *résumé* of stellar spectroscopy prepared by M. A. de Gramont. This will be found very useful for reference, as it contains a brief account of the various stellar classifications of Secchi, Pickering, Lockyer, and others, with notes on their correlation. The annuaire is published by Gauthier-Villars, Paris, at 1.50 francs.

THE CORRELATION OF THE TEACHING OF MATHEMATICS AND SCIENCE.

IT is known that for some time past the Mathematical Association has been arranging for a joint committee with the Association of Public Schools Science Masters to report on the teaching of mathematics in connection with science. In furtherance of the same object a conference was held at the Regent Street Polytechnic on Saturday, November 28, between the Mathematical Association and the Federated Association of London Non-primary Teachers, the main feature being an address by Prof. John Perry, F.R.S., bearing the title of this article.

Prof. Perry said that a certain senior wrangler had objected to the name mathematician being applied to a mathematical physicist, and he therefore confined the term to those who were enlarging the scope of pure mathematics. Mathematicians, instead of being able to devote themselves to research, were forced to teach elementary classes; they also took part in examinations, and sometimes wrote treatises on hydrostatics, which were really books on integral calculus with such terms as pressure and depth.

The consequence was that too much attention was given to so-called rigorous proofs, and boys wasted much time in learning such subjects as deductive geometry, artificial devices for solution of triangles, and drudgery with algebraic symbols. The conditions of one examination at one British university had led to the creation of 90 per cent. of elementary algebra and trigonometry in Great Britain, this unnecessary 90 per cent. being as complex and tricky as it was possible to make it. Until this sort of thing was done away with the marriage of mathematics and science was like that of December and May. He alluded to the arbitrary division of examinations into water-tight compartments headed "Algebra," "Trigonometry," "Mechanics." He maintained that students ought to learn to use logarithms, and even Fourier's theorem, long before they could prove their methods. He thought school lessons should be on the type of Sandford and Merton and Mr. Barlow. There should be no division into subjects. Boys should learn to weigh and to measure, to calculate and to find things out for themselves. The form-masters should be all-round men, not specialists There should be one teacher to every ten boys, and that teacher should be well paid. Every master should be responsible for English composition. If a boy wrote a description of anything he had done in a laboratory or elsewhere, it should be an exercise in English. He referred to the methods of teaching adopted by Dr. Andrews, of carbonic acid fame. Continuing, it astonished him to see how little comprehension there was of the proposals of the British Association committees. They recommended some work with graphs on squared paper, and some teachers did nothing but graphs, and there were dozens of school-books to help on the craze. The surprising thing was that many teachers seemed to have no individuality, no originality, nor even the power to think for themselves at all. He asked that the changes that were taking place should go on unchecked. Mistakes would be made at first, and it was their duty to make the public believe in the necessity for better paid teachers in order to attract really able men.

Prof. Bryan, who occupied the chair, thought Prof. Perry attached too much importance to the distinction which an idealist drew between a mathematician and a mathematical physicist. Consequently, his address tended to give the impression that the man who did research in pure mathematics was at the root of all the evil. In Prof. Bryan's opinion the fault rather lay with those whose only idea of research consisted in inventing